In [8]:

```
import numpy as np
import pandas as pd
import scipy as sp
```

In [9]:

```
%matplotlib inline
import matplotlib.pyplot as plt
plt.style.use('ggplot')
```

In [10]:

```
%%file hw_data.csv
id,sex,weight,height
1,M,190,77
2,F,120,70
3,F,110,68
4,M,150,72
5,O,120,66
6,M,120,60
7,F,140,70
```

```
Overwriting hw_data.csv
```

Python

1. Finish creating the following function that takes a list and returns the average value.

In [4]:

```
def average(my_list):
    total = 0
    for item in my_list:
        total = total + item
    count = len(my_list)
    avg = total/count

    return avg


average([1,2,1,4,3,2,5,9])
```

Out[4]:

```
3.375
```

2. Using a Dictionary keep track of the count of numbers (or items) from a list

```
In [5]: def counts(my_list):
            counts = dict()
            for item in my_list:

                if item in counts:
                    counts[item] += 1
                else:
                    counts[item] = 1


            return counts

        counts([1,2,1,4,3,2,5,9])

Out[5]: {1: 2, 2: 2, 3: 1, 4: 1, 5: 1, 9: 1}
```

3. Using the `counts()` function and the `.split()` function, return a dictionary of most occuring words from the following paragraph. Bonus, remove punctuation from words.

In [6]:

```
import string

paragraph_text = '''
For a minute or two she stood looking at the house, and wondering what to do
The Fish-Footman began by producing from under his arm a great letter, nearl
Then they both bowed low, and their curls got entangled together.
Alice laughed so much at this, that she had to run back into the wood for fe
Alice went timidly up to the door, and knocked.
‘There’s no sort of use in knocking,’ said the Footman, ‘and that for two re
‘Please, then,’ said Alice, ‘how am I to get in?’
‘There might be some sense in your knocking,’ the Footman went on without at
‘I shall sit here,’ the Footman remarked, ‘till tomorrow—’
At this moment the door of the house opened, and a large plate came skimming


counts(paragraph_text.split())
```

Out[6]:

```
{'Alice': 4,
 'Alice,': 1,
 'An': 2,
 'And': 1,
 'At': 1,
 'But': 1,
 'Duchess': 1,
 'Duchess.': 1,
 'First,': 1,
 'Fish-Footman': 2,
 'Footman': 2,
 'Footman,': 1,
 'Footman’s': 1,
 'For': 2,
 'Frog-Footman': 1,
 'He': 1,
 'I': 3,
 'It': 1,
 'I’m': 1,
 'Queen': 1
```

In [7]:

```
# Bonus: Without Punctuation
import string

paragraph_text = '''
For a minute or two she stood looking at the house, and wondering what to dc
The Fish-Footman began by producing from under his arm a great letter, nearl
Then they both bowed low, and their curls got entangled together.
Alice laughed so much at this, that she had to run back into the wood for fe
Alice went timidly up to the door, and knocked.
‘There’s no sort of use in knocking,’ said the Footman, ‘and that for two re
‘Please, then,’ said Alice, ‘how am I to get in?’
‘There might be some sense in your knocking,’ the Footman went on without at
‘I shall sit here,’ the Footman remarked, ‘till tomorrow—’
At this moment the door of the house opened, and a large plate came skimming


for item in string.punctuation:
    paragraph_text = paragraph_text.replace(item,'')

# print(paragraph_text)

counts(paragraph_text.split())
```

Out[7]:

```
{'Alice': 5,
 'An': 2,
 'And': 1,
 'At': 1,
 'But': 1,
 'Duchess': 2,
 'First': 1,
 'FishFootman': 2,
 'Footman': 3,
 'Footman’s': 1,
 'For': 2,
 'FrogFootman': 1,
 'He': 1,
 'I': 3,
 'It': 1,
 'I’m': 1,
 'Queen': 2,
 'She': 1,
 'The': 2,
 'Then': 1
```

4. Read in a file and write each line from the file to a new file Title-ized

`This is the first line` -> `This Is The First Line`

Hint: There's a function to do this

In [12]:
```
import string

f = open('title_ized_file.txt')
file_text = f.read()
f.close()
print(file_text.title())
s = file_text.title()

with open('file_text_titleized', 'w') as nf:
    nf.write(s)
```

```
For A Minute Or Two She Stood Looking At The House And Wondering What To
 Do Next When Suddenly A Footman In Livery Came Running Out Of The Wood—S
he Considered Him To Be A Footman Because He Was In Livery Otherwise Judg
ing By His Face Only She Would Have Called Him A Fish—And Rapped Loudly A
t The Door With His Knuckles It Was Opened By Another Footman In Livery W
ith A Round Face And Large Eyes Like A Frog And Both Footmen Alice Notice
d Had Powdered Hair That Curled All Over Their Heads She Felt Very Curiou
s To Know What It Was All About And Crept A Little Way Out Of The Wood To
Listen
The Fishfootman Began By Producing From Under His Arm A Great Letter Near
ly As Large As Himself And This He Handed Over To The Other Saying In A S
olemn Tone ‘For The Duchess An Invitation From The Queen To Play Croquet’
The Frogfootman Repeated In The Same Solemn Tone Only Changing The Order
 Of The Words A Little ‘From The Queen An Invitation For The Duchess To P
lay Croquet’
Then They Both Bowed Low And Their Curls Got Entangled Together
Alice Laughed So Much At This That She Had To Run Back Into The Wood For
 Fear Of Their Hearing Her And When She Next Peeped Out The Fishfootman W
as Gone And The Other Was Sitting On The Ground Near The Door Staring Stu
pidly Up Into The Sky
Alice Went Timidly Up To The Door And Knocked
‘There’S No Sort Of Use In Knocking’ Said The Footman ‘And That For Two R
easons First Because I’M On The Same Side Of The Door As You Are Secondly
Because They’Re Making Such A Noise Inside No One Could Possibly Hear Yo
u’ And Certainly There Was A Most Extraordinary Noise Going On Within—A C
onstant Howling And Sneezing And Every Now And Then A Great Crash As If A
Dish Or Kettle Had Been Broken To Pieces
‘Please Then’ Said Alice ‘How Am I To Get In’
‘There Might Be Some Sense In Your Knocking’ The Footman Went On Without
 Attending To Her ‘If We Had The Door Between Us For Instance If You Were
Inside You Might Knock And I Could Let You Out You Know’ He Was Looking U
p Into The Sky All The Time He Was Speaking And This Alice Thought Decide
dly Uncivil ‘But Perhaps He Can’T Help It’ She Said To Herself ‘His Eyes
 Are So Very Nearly At The Top Of His Head But At Any Rate He Might Answe
r Questions—How Am I To Get In’ She Repeated Aloud
‘I Shall Sit Here’ The Footman Remarked ‘Till Tomorrow—’
At This Moment The Door Of The House Opened And A Large Plate Came Skimmi
ng Out Straight At The Footman’S Head It Just Grazed His Nose And Broke T
o Pieces Against One Of The Trees Behind Him
```

Numpy

1. Given a list, find the average using a numpy function.

```
In [13]: import numpy as np

         simple_list = [1,2,1,4,3,2,5,9]

         avg = np.mean(simple_list)
         print(avg)

         3.375
```

2. Given two lists of Heights and Weights of individual, calculate the BMI of those individuals, without writing a `for-loop`

```
In [5]: import numpy as np

        heights = [174, 173, 173, 175, 171]
        weights = [88, 83, 92, 74, 77]

        # Assuming Metric:
        # Height is in centimeters(CM) -> convert to meters
        # Weight is in kilograms(kg)
        # BMI = weight/(height/100)^2

        np_heights = np.array(heights)
        # print(np_heights)
        np_weights = np.array(weights)
        # print(np_weights)

        bmi = np_weights / (np_heights/100)**2

        print(bmi)



        [ 29.06592681  27.73229978  30.73941662  24.16326531  26.33288875]
```

3. Create an array of length 20 filled with random values (between 0 to 1)

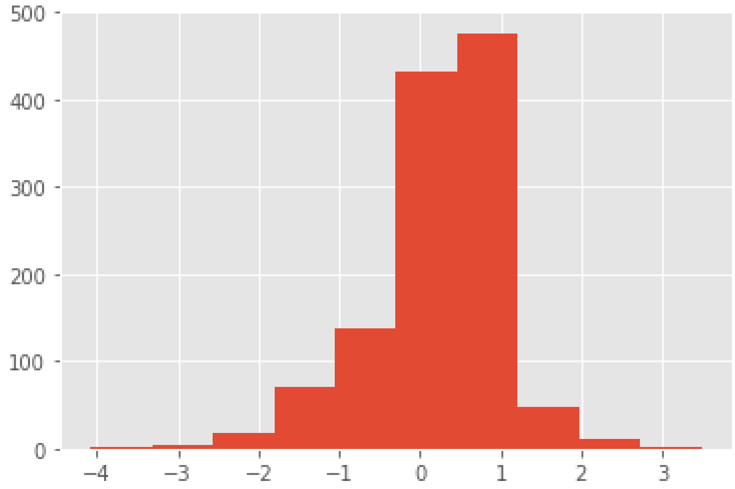
```
In [14]: import numpy as np
         np.random.rand(20)

Out[14]: array([ 0.748737  ,  0.01097808,  0.2853616 ,  0.19541661,  0.28853596,
                 0.10737131,  0.95862189,  0.35104309,  0.75794109,  0.82828012,
                 0.21833716,  0.20654268,  0.89019699,  0.50383426,  0.75913226,
                 0.21275853,  0.34699101,  0.67723952,  0.63318042,  0.91212196])
```

Bonus. 1. Create an array with a large (>1000) length filled

with random numbers from different distributions (normal, uniform, etc.). 2. Then, plot a histogram of these values.

```
In [13]: import numpy as np

         a = np.random.rand(600)
         a = np.array(a)
         # print(len(a))
         # print(type(a))
         b = np.random.randn(600)
         b = np.array(b)
         # print(len(b))
         # print(type(b))

         y = np.concatenate([a,b])
         print(len(y))

         plt.hist(y, normed=False)
```

```
         1200

Out[13]: (array([   1.,    5.,   18.,   70.,  137.,  432.,  476.,   48.,   11.,
         2.]),
          array([-4.07481627, -3.31892728, -2.56303829, -1.80714931, -1.05126032,
                 -0.29537133,  0.46051765,  1.21640664,  1.97229562,  2.72818461,
                  3.4840736 ]),
          <a list of 10 Patch objects>)
```



Pandas

1. Read in a CSV () and display all the columns and their respective data types

```
In [16]: import pandas as pd
         df = pd.read_csv('hw_data.csv').head()
         # print(df)
         df.dtypes
```

```
Out[16]: id          int64
         sex        object
         weight      int64
         height      int64
         dtype: object
```

2. Find the average weight

```
In [17]: df['weight'].mean()
```

```
Out[17]: 138.0
```

3. Find the Value Counts on column `sex`

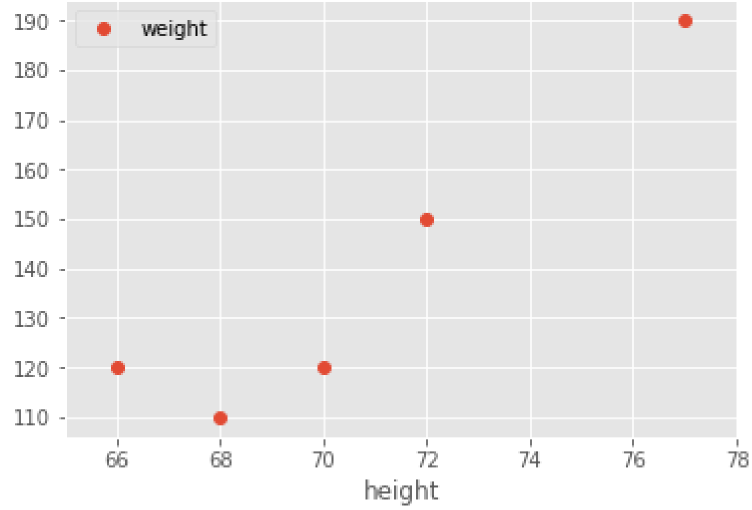
```
In [18]: df['sex'].value_counts()
```

```
Out[18]: F    2
         M    2
         O    1
         Name: sex, dtype: int64
```

4. Plot Height vs. Weight

```
In [19]: ax = df.plot(x='height', y='weight', style='o')
         ax.set(xlim=[65, 78])
```

```
Out[19]: [(65, 78)]
```



5. Calculate BMI and save as a new column

In [20]:

```
# BMI = weight (lbs) * 0.45) / (height (in) *0025)^2

df['BMI'] = (df['weight']*0.45)/((df['height']*0.025)**2)
print(df.head())
```

```
   id sex  weight  height        BMI
0   1   M     190      77  23.073031
1   2   F     120      70  17.632653
2   3   F     110      68  17.128028
3   4   M     150      72  20.833333
4   5   O     120      66  19.834711
```

6. Save sheet as a new CSV file `hw_dataB.csv`

In [21]:

```
df.to_csv('hw_dataB.csv')
```

Run the following

In [22]:

```
!cat hw_dataB.csv
```

```
,id,sex,weight,height,BMI
0,1,M,190,77,23.073030865238653
1,2,F,120,70,17.632653061224488
2,3,F,110,68,17.128027681660896
3,4,M,150,72,20.833333333333332
4,5,O,120,66,19.834710743801647
```

In [ ]:

```

```